CEE 6651
Infrastructure Systems
Course Syllabus
Fall 2002

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Office Hours:	Mon/Tue, 2 – 4P, and by appointment
Credits:	3 Hours

Course Description and Objectives

This course reviews the status of infrastructure and infrastructure management, the analytical methods, tools, data, technologies, and political and financial framework and constraints for managing infrastructure systems and facilities as assets. Topics covered include condition assessment, deterioration modeling, engineering economics, evaluation of project alternatives, optimization and ranking, ISTEA management systems, sustainability, and strategic environmental assessment for infrastructure decision-making. Transportation infrastructure systems are used as a case study for the course; however the asset management principles and methods taught are applicable to various types of infrastructure systems.

Upon completing this course, students are expected to understand the issues involved in cradle-to-cradle management of infrastructure facilities and systems as assets, the methods, tools and other resources available for this task, as well as existing constraints in implementing asset management. Students are also expected to demonstrate a basic understanding of the fundamental principles of professional communications: written, oral and visual, in their term project reports and oral presentations.

Textbooks

The following textbooks are on reserve in the library:

- Infrastructure Management (Hudson, Haas and Uddin, 1997)
- Modern Pavement Management (Haas, Hudson and Zaniewski, 1994)
- Pavement Management for Airports, Roads and Parking Lots, (Shahin, 1994)
- Engineering Economy (Thuesen and Fabrycky, 2001)

In addition, articles have been assigned from the literature. These readings complement and build upon the lecture material.

Evaluation

Homework	30%
Midterm	30%
Project	30%
Summaries	10%

Course Outline

Week	Date	Topics
1	Aug 21	Course Overview, Status of Infrastructure and Infrastructure Management, Needs Assessment
2	Aug 28	Deterioration Models
3	Sep 4	Condition Assessment
4	Sep 11	Engineering Economics I
5	Sep 18	Engineering Economics II
6	Sep 25	Project Evaluation *Term Project Description Due*
7	Oct 2	Midterm
8	Oct 9	Principles of Communication: Written, Oral and Visual*
9	Oct 16	ISTEA Management Systems/Asset Management
10	Oct 23	Sustainability
11	Oct 30	Portfolio Theory Applications
12	Nov 6	Systems-level Environmental Assessment *Draft Report Due*
13	Nov 14	Case Studies
14	Nov 20	Project Presentations
15	Nov 27	Final Project Report Due

* Dr. Lisa Rosenstein

Assigned Readings (Aug 21 – Sep 25, 2002)

Week 1: Course Overview, Status of Infrastructure and Asset Management, Needs Assessment

Grant, Albert. "Civil Infrastructure Systems: The Big Picture," Journal of Infrastructure Systems, Vol. 1, No. 2, June 1995, pp. 78-81

Hudson, Ronald W., Haas, Ralph and Waheed Uddin. Infrastructure Management, McGraw-Hill, 1997. Chapter 1: The Big Picture, pp. 3-28, Chapter 2: Framework for Infrastructure Management, pp. 3-28, and Chapter 3: Planning, Needs Assessment and Performance Indicators, pp. 45-60.

Lemer, Andrew and Ken Chong. Research as a Means for Improving Infrastructure, ASCE Journal of Infrastructure Systems, Vol. 1, No. 1, March 1995, pp. 6-15.

Kessides, Christine and Gregory Ingram. Infrastructure's Impact on Development: Lessons from WDR 1994. ASCE Journal of Infrastructure Systems, Vol. 1, No. 1, March 1995, pp. 16-31.

National Council on Public Works Improvement (NCPWI), "The Nation's Public Works, Defining the Issues," Needs Studies (Chapter 2), Washington, D.C., 1986, pp. 7-21.

National Council on Public Works Improvement (NCPWI), Fragile Foundations: A Report on America's Public Works, February 1988.

Gordon, Cameron. Congressional Response to Fragile Foundations: Analysis of Congressional Infrastructure Legislation introduced since 1988. ASCE Journal of Infrastructure Systems, Vol. 3, No. 1, March 1997, pp. 23-30.

Kaplan, Marshal. Infrastructure Needs Assessment: Methodological Problems and Opportunities. In Public Infrastructure Planning and Management. Edited by Jay M. Stein. Sage Publications, 1988.

Lee, Douglas. Measuring Infrastructure Needs: Focus on Highways. In Public Infrastructure Planning and Management. Edited by Jay M. Stein. Sage Publications, 1988.

ASCE Report Card, 2001. www.asce.org

*Dunker, Kenneth and Basile Rabat. "Assessing Infrastructure Deficiencies: The Case of Highway Bridges," Journal of Infrastructure Systems, Vol. 1, No. 2, June 1995, pp. 100 - 119.

Week 2: Infrastructure Deterioration Modeling and Performance Measurement

Humplick, F. and W. D. O. Paterson, "Framework of Performance Indicators for Managing Road Infrastructure and Pavements," Proceedings of the 2nd International Conference on Managing Pavements, Transportation Research Board, 1994.

Board of Infrastructure and the Constructed Environment (BICE), National Research Council. Measuring and Improving Infrastructure Performance. Studies in Technology and Policy. Washington, DC, 1995.

Karaa, Fadi and David Marks. "Performance of Water Distribution Networks: An Integrated Approach," Journal of Performance of Constructed Facilities, Vol. 4, No 1 Feb 1990.

Ben-Akiva, Moshe and Dinesh Gopinath. Modeling Infrastructure Performance and User Costs. ASCE Journal of Infrastructure Systems, Vol. 1, No. 1, March 1995, pp. 33-43.

Ramaswamy, R. "Estimation of Latent Performance from Damage Measurements," Department of Civil Engineering, Massachusetts Institute of Technology, June 1989, Chapter 2 – Pavement Deterioration Models – State of the Art.

Ben-Akiva, M. and R. Ramaswamy, "An Approach for Predicting Latent Infrastructure Facility Deterioration," Transportation Science, Vol. 27, No 2, May 1993.

Week 3: Infrastructure Condition Assessment

Shahin, M. Y. Pavement Management for Airports, Roads and Parking Lots, Chapter 3: Pavement Distress Survey and Rating Procedures, 1994.

Maser, Ken. Condition Assessment of Transportation Infrastructure using Ground Penetrating Radar. ASCE Journal of Infrastructure Systems, Vol. 2, No. 2, June 1996, pp. 94-101.

Quimpo, Rafael G., and Sue-Jen Wu. Condition Assessment of Water Supply Infrastructure. ASCE Journal of Infrastructure Systems, Vol. 3, No. 1, March 1997, pp. 15-22.

Lemer, Andrew C. Infrastructure Obsolescence and Design Service Life. ASCE Journal of Infrastructure systems, Vol. 2, No. 4, Dec 1996, pp. 153-161.

Weeks 4 and 5: Engineering Economics I & II

Engineering Economy, Thuesen and Fabrycky, 1999.

Week 6: Evaluation of Alternatives

Hudson, Ronald W., Haas, Ralph and Waheed Uddin. Infrastructure Management, McGraw-Hill, 1997. Chapter 14: Life-cycle Cost and Benefit Analysis, pp. 291-312.

Arditti, David and Hany Mounir Messiha. "Life Cycle Cost Analysis (LCCA) in Municipal Organizations." ASCE Journal of Infrastructure Systems, March 1999, Vol. 5, No. 1, pp. 1-9.

Brennan, Timothy J. Balancing Present Costs and Future Benefits. In Financing Tomorrow's Infrastructure – Challenges and Issues. Proceedings of a Colloquium, October 20, 1995. Board on Infrastructure and the Constructed Environment. Commission on Engineering and Technical Systems, National Research Council. National Academy Press, Washington, D.C., 1996.

Venkatesh, Ravirala and Dimitri Grivas. State Increment Method of Life Cycle Cost Analysis in Highway Management. ASCE Journal of Infrastructure Systems, Sep 1995, Vol. 1, No. 3., pp 151-159.